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Misreporting of Dietary Intake Affects Estimated Nutrient Intakes in Low-Income Spanish-Speaking Women

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Abstract

Misreporting of dietary intake affects the validity of data collected and conclusions drawn in studies exploring diet and health outcomes. One consequence of misreporting is biological implausibility. Little is known regarding how accounting for biological implausibility of reported intake affects nutrient intake estimates in Hispanics, a rapidly growing demographic in the United States. Our study explores the effect of accounting for plausibility on nutrient intake estimates in a sample of Mexican-American women in northern California in 2008. Nutrient intakes are compared with Dietary Reference Intake recommendations, and intakes of Mexican-American women in a national survey are presented as a reference. Eighty-two women provided three 24-hour recalls. Reported energy intakes were classified as biologically plausible or implausible using the reported energy intakes to total energy expenditure cutoff of <0.76 or >1.24, with low-active physical activity levels used to estimate total energy expenditure. Differences in the means of nutrient intakes between implausible (n=36) and plausible (n=46) reporters of energy intake were examined by bivariate linear regression. Estimated energy, protein, cholesterol, dietary fiber, and vitamin E intakes were significantly higher in plausible reporters than implausible. There was a significant difference between the proportions of plausible vs implausible reporters meeting recommendations for several nutrients, with a larger proportion of plausible reporters meeting recommendations. Further research related to misreporting in Hispanic populations is warranted to explore the causes and effects of misreporting in studies measuring dietary intake, as well as actions to be taken to prevent or account for this issue.

Keywords

Misreporting; Plausibility; Dietary recall; Minority; Hispanic

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST
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ACCURATE SELF-REPORTED DIETARY INFORMATION is essential in studies exploring the connection between diet and development of chronic disease.[1] Misreporting of dietary intake refers to inaccurate reporting of foods consumed, and is one of the main sources of error in dietary assessment.[2] Misreporting includes both over- and underreporting, and affects the validity of the data collected and conclusions drawn.[2] To estimate the occurrence of misreporting, biological plausibility of reported intake may be determined. The result indicates whether the reported dietary intake level is biologically plausible given physiological status and physical activity level. There are several ways to account for biological plausibility during analysis. One possibility is to exclude extreme values based on data distribution or subjective assessment.[3] Alternatively, reported energy intake (rEI) may be compared with total energy expenditure (TEE), and implausible reports may be screened out using cutoffs.[3,4] TEE may be either predicted or measured using relatively inexpensive methods such as self-report questionnaire or more costly techniques such as doubly-labeled water.[3,4] Determination of biological plausibility using these methods to estimate misreporting is an important step in ensuring the validity of dietary data.

In considering misreporting, it is important to note the potential threats to the validity of self-reported dietary information. Measurement error is introduced when 24-hour recalls are conducted, resulting in a list of consumed foods that may not accurately reflect all food types and amounts.[5] Baranowski and colleagues[6,7] identify “intrusions” in 24-hour recalls as foods reported but not eaten, “matches” as foods reported and eaten, and “omissions” as foods eaten, but not reported. Food omissions and inaccurate portion size estimates have been found to be two major sources of error.[8] Respondents’ ability to estimate portion size may be compromised if portion size measurement aids are inadequate or if respondents are not accustomed to using them,[9] if the foods are amorphous (without a specified shape, such as fruit salad),[10] or if foods eaten in small portions are not ascertained (ie, spreads).[11] In addition to these threats, social desirability might be the source of invalidity for systematic misreporting of dietary intake.[12] The accuracy of the data collected in an interviewer-conducted 24-hour recall also depends on an interviewer's ability to probe for details about foods reported, and to record intake correctly and completely.[6] Also, in studies examining dietary intake of ethnic groups, systematic biases may be introduced due to lack of appropriate food composition data for these groups and substitution of nutrient values for other “similar” foods.[13] The traditional Mexican diet, for example, may contain items such as *atole*, a corn-based gruel, *chilaquiles*, a dish composed of tortillas and sauces, and *aguas frescas* de *fruta*, homemade fruit-based drinks, which may not be contained in many food composition tables.[14] Finally, lack of motivation is a potential source of error for both subjects and interviewers.[15] If a participant does not perceive the study to be important and applicable, he/she may not be motivated to provide complete information, producing results that are inaccurate.[16] The interviewer plays an important role in motivating participants to provide accurate information, and must convey enthusiasm to the participant while establishing rapport and creating an atmosphere of trust.[15] Misreporting error may be systematic or random. The latter affects the population variance, but not the mean intake. Systematic error, in contrast, alters the mean intake.[17]

Underreporting has been found to be more common than overreporting across adult population groups.[1] Recent literature reviews indicate that substantial underreporting occurs in most adult populations, with greater underreporting occurring in women, those with less education, and those with a higher body mass index (BMI).[1,2] Although substantial underreporting in women has been observed in a number of studies,[18-20] studies in women of minority populations have indicated that patterns of misreporting and contributing factors may differ among population subgroups. For example, unexpected results were found in 418 male and female Native American adults on the Pacific northwest coast of Washington State, with ≥85% being overweight or obese and more than half (56%) reporting plausible energy intake.[21] Overreporting was also more common in this population than in others previously studied, with 7% of women classified as overreporters and 32% as underreporters.[21] These trends warrant further investigation in other diverse populations.

Although numerous studies have examined misreporting in non-Hispanic populations, only two studies using 24-hour dietary recalls have focused exclusively on Hispanics,[22,23] and explored rates and correlates of underreporting. In the first, rates of underreporting in a random sample of 357 Mexican/Mexican-American women aged 21 to 67 years in California ranged from 11.9% to 81.3% depending on underreporting detection methods used to determine these rates.[22] Physical activity level (PAL) was measured using a questionnaire, and cutoff values were adjusted in the different detection methods based on these levels. Underreporting detection methods were as follows, and differed by adjustment for sample size and PAL, as well as cutoffs selected: adjusted for sample size but not PAL; adjusted for sample size and PAL; used a conservative form of the Goldberg cutoff assuming a sample size of n=1, not accounting for PAL; calculated the cutoff value based on a sample size of n=1 and all PAL; compared participant energy intake (EI) to basal metabolic rate (BMR) ratio to the sample's median EI:BMR. In the second study, BMR multiplied by an activity factor was compared with rEI to calculate number of calories underreported in 215 Caribbean Hispanics aged 26 to 79 years.[23] Participants underreported an average of 254 kcal/day; the proportion of participants determined to have plausible intake was not reported. In reviewing these findings, it is important to note that the generalizability is limited, because these two studies were conducted in select segments of the Hispanic population, which is composed of many diverse subgroups.

Because the aforementioned studies are the only two using 24-hour dietary recalls focused on the topic of misreporting in Hispanics exclusively, and because nearly one in three US residents is projected to be Hispanic in 2060,[24] further exploration of the accuracy of reporting in Hispanics is warranted. In particular, it is important to determine how accounting for plausibility of reported intake affects nutrient intake estimates to enable comparison with other racial/ethnic groups.[25,26] Previous studies in underserved minorities have indicated that accounting for plausibility, determined by comparing rEI with predicted energy requirements or expenditure,[3,4] significantly influences nutrient intake estimates.[21,27] In the aforementioned study in Native-American adults in which most individuals were overweight or obese, accounting for plausibility had a significant effect on whether participants were categorized as meeting recommendations for macro- and micronutrients, with a larger proportion of plausible reporters meeting recommendations whenever there was a significant difference.[21]

In interpreting study results, it is essential to consider the validity of dietary data. The simplest and most readily available method is to use reference methods for calculating biological plausibility.[4,28] Determining plausibility of rEI, as well as the difference in nutrient consumption estimates in plausible vs implausible reporters, is important for several reasons. First, in studies examining the relationship between dietary intake and health outcomes, plausibility must be considered to obtain an accurate picture of intake and determine whether individuals meet recommendations to ensure that relationships are not obscured or confounded.[2] Second, findings from studies involving rEI are often used to identify possible behaviors to target for promoting healthful dietary change and to develop consumer health messages.[29] Finally, dietary data reflecting actual intake is necessary to identify populations at risk, as well as to provide baseline data from which one could assess the effectiveness of interventions.

The goal of this study was to explore the accuracy of reported dietary data in a convenience sample of Mexican-American women in northern California. The first objective of this study was to determine whether reported nutrient intakes differ between individuals classified as having plausible compared with implausible rEI. The nutrient intakes of Mexican-American women who participated in the National Health and Nutrition Examination Survey (NHANES) 2007-2008 are presented as a reference. In comparing estimated nutrient intakes with current Dietary Reference Intake (DRI)[30] recommendations, the second objective was to determine whether accounting for plausibility of rEI influences the assessment of whether the population is meeting dietary recommendations. It was hypothesized that estimated nutrient intakes would be significantly higher in plausible reporters than implausible, and that implausible reporters would be less likely to meet recommendations.

METHODS

Sample

The current study is a secondary analysis of data from a study conducted at the University of California, Davis, in four California counties. Ninety women were recruited to participate, with the following inclusion criteria: aged 18 years or older, speak Spanish as a first language, meet income eligibility for Supplemental Nutrition Assistance Program-Education, and have at least one child/youth younger than age 19 years living at home. Details of the study population, design, and method have been published previously and are presented briefly below.[31] The institutional review board from the University of California, Davis approved the study protocol and all participants provided written informed consent.

Measures

Demographic data were collected, including age, country of birth, number of years in the United States, years of education, monthly housing cost, household size, and marital status. Acculturation was determined by the Bidimensional Acculturation Scale for Hispanics,[32] which measures adherence to two cultural domains, Hispanic and non-Hispanic. Height, weight, and waist circumference were collected using standardized anthropometric equipment and procedures.[33] BMI was calculated using the formula weight (in kilograms)/height (in meters^2). All participants completed three nonconsecutive 24-hour recalls on two weekdays and one weekend day using the US Department of Agriculture (USDA) five-pass method.[34] Native-speaking interviewers conducted the in-person interviews in Spanish using standardized probes and models to aid in portion size estimation. The majority of recalls were conducted in participants' homes. The first author, who speaks Spanish as a second language, was present at all interviews to ensure consistency of data collection procedures. One respondent was interviewed at a time. No reading and writing skills were required of respondents. Foods were entered into the Food Processor SQL software package (version 10.3, 2008, ESHA Research), which incorporates the USDA nutrient database. PAL was estimated based on administration of a physical activity questionnaire in a subset of the population (n=49). The questionnaire was a modified low-literacy version of the International Physical Activity Questionnaire with visuals, and was used to determine PAL through self-reported frequency, duration, and intensity of activity.[35]

DRI equations were used to calculate predicted energy requirements.[30] To calculate TEE, PAL was imputed as 1.12 for women. These coefficients coincide with being low active (typical daily living activities plus 30 to 60 minutes of daily moderate activity).[30] Low active falls between sedentary and active and was determined to best represent the PAL of this group based on results from the physical activity questionnaire administered to the sample subset described above. rEIs were classified as plausible or implausible using the rEI:TEE cutoff of <0.76 or >1.24.[28] Both underreporters (rEI:TEE<0.76) and overreporters (rEI:TEE>1.24) were classified as implausible.

NHANES 2007-2008 data, collected in the same manner during a similar time period, was used as a reference, which allows for consideration of how participants' intake data differs from that of a national sample.[36] These data were selected rather than the Hispanic HANES collected from 1982 to 1984,[37] because this may not reflect current intake. To ensure that the reference group was similar to the population group examined, the NHANES data were limited to Mexican-American women of the same age range born in either the United States or Mexico.

Statistical Analysis

Differences in age, BMI, acculturation, and other indicators of socioeconomic status between those considered to have plausible and implausible rEI were determined by χ^2 (categorical variables) and analysis of variance (noncategorical). All variables were evaluated for meeting the assumptions of normal distributions.[38] No variable was determined to need transformation.

The means of selected nutrients were computed for each individual. Group means of nutrient intakes were used to present nutrient intake profiles of the population. Individual mean nutrient intakes were used to determine the proportions of individuals falling below the Estimated Average Requirements, above the Adequate Intakes, and within the Acceptable Macronutrient Distribution Ranges.[30]

The differences in the means of nutrient intakes (dependent variable) between the implausible and plausible reporters of energy intake (independent variable) were examined by bivariate linear regression. Age was determined to not significantly (P>0.05) influence intake in this young sample and was therefore not adjusted for in the model. The differences in the proportions of those meeting or not meeting the DRI for the selected nutrients (dependent variable) by implausible and plausible reporters of energy intake (independent variable) were evaluated by binary logistic regression. Each nutrient was assessed separately. All analyses were conducted with SPSS (version 21.0, 2012, IBM-SPSS Inc). Results were considered significant at P<0.05.

RESULTS AND DISCUSSION

Of 90 women recruited, eight did not complete all three days of dietary data collection or did not supply all necessary data and were excluded from the analysis. Therefore, the total sample for inclusion was 82 with plausible (n=46) and implausible (n=36) reporters (Table 1). The women ranged in age from 21 to 54 years, with an average age of 36 years, and were Mexican American. The majority had a BMI ≥25, had a high school education or less, were married, and identified more with the traditional Hispanic culture than with the non-Hispanic culture of the United States (Table 1). There were no significant differences in any of the characteristics shown in Table 1 between those with plausible and implausible rEI. A subset of the women (n=49) participated in a second study related to physical activity and provided responses to a physical activity questionnaire. Of these, more than half (n=26) had “moderate” or “low” levels of physical activity.

Energy, macronutrient, and micronutrient intakes are presented for the total sample and as separated by plausible rEI or implausible rEI (Table 2). Absolute values of estimated energy, protein (grams/kilogram/day), cholesterol, and dietary fiber intakes were significantly higher among the plausible compared with the implausible rEI group, reflecting that most (86%) implausible reporters under- rather than overreported. In examining macronutrient intake in terms of contribution to energy intake, protein made a significantly higher contribution to total energy intake in implausible reporters. This remained the same when examining grams of protein intake per 1,000 kcal. Although this may be a reflection of underreporting fat and carbohydrate intake, this also may reflect “intrusions,” or foods reported but not eaten, in the recall.[6,7] With regard to micronutrients, vitamin E was the only nutrient that was consumed in significantly higher amounts in plausible reporters. Further investigation is warranted in future studies in similar population groups regarding foods that may be overreported, because specific foods consumed in this study were not examined.

In addition to revealing the degree of misreporting in an underserved population and effects on nutrient intake estimates, this study also provides dietary intake information for a convenience sample of Mexican-American women in northern California; data from Mexican-American women in NHANES are provided as a reference (Table 2). Mean daily intakes of energy, percent energy from carbohydrate, and dietary fiber were higher in the study sample than in NHANES 2007-2008. Intake of micronutrients was generally lower in the study sample than in Mexican-American women from NHANES (2007-2008), with the exception of vitamins A, C, and B-12. These trends remained when limiting the study sample to plausible rEI. Given that energy intake was substantially higher in the current sample, and micronutrient intake was generally lower than in Mexican-American women in NHANES, the implication is higher nutrient density in the diet of the NHANES sample. Of note, some of the differences in mean intakes of the study sample compared with the NHANES sample were substantial, such as in the case of vitamin K, folate, and phosphorus. These differences may partially be explained by differences in the food composition data used. NHANES dietary data are analyzed using the USDA Food and Nutrient Database for Dietary Studies (version 3.0, 2008, Agricultural Research Service, Food Surveys Research Group), and dietary data from participants in the current study were analyzed using the ESHA Research food and nutrient database (version 10.3, 2008, ESHA Research), which draws upon the USDA database, manufacturer's data, restaurant data, and data from literature sources. The ESHA Research database allows for the entry of new recipes consumed in diverse cultural groups, whereas the USDA National Nutrient Database does not. Differences in intake may also be partially explained by the differences in the demographic characteristics of the sample in the current study and that of NHANES, because all participants in the current study were low income and low literacy. Also of note, whereas plausibility is not assessed formally in NHANES, the NHANES data are reviewed, a data quality determination is made, and results are reported for complete and reliable interviews.[39]

The percentage of participants meeting DRI recommendations for macro- and micronutrients, as well as dietary fiber, was also examined (Table 3). The majority of both plausible and implausible reporters were within acceptable ranges for percentage of calories from protein, carbohydrate, and total fat. There was a significant difference in the percentage of plausible vs implausible reporters meeting dietary recommendations for fiber intake, with a larger percentage of plausible reporters meeting the AI. In terms of micronutrients, there were significant differences between the percentage of plausible and implausible reporters meeting recommendations for niacin, iron, copper, selenium, and sodium, with a larger percentage of plausible reporters meeting recommendations in all cases except for sodium.

In the current study, estimates of intake of several nutrients, namely protein (grams/kilogram/day), cholesterol, dietary fiber, and vitamin E, were significantly influenced by considering plausibility of rEI, demonstrating the importance of accounting for this factor. There have been many previous studies examining dietary intake in Hispanics that have not accounted for plausibility,[40-43] increasing the likelihood of inaccurate nutrient intake estimates. Past studies that accounted for biological plausibility in other groups have demonstrated similar effects on nutrient intake estimates. In a study exploring nutrient intake estimates in an underserved Native-American population on the Pacific northwest coast of Washington State, accounting for biological plausibility resulted in higher mean estimates for a majority of nutrients.[21] Similarly, in a nationally representative sample of the US population, vitamin, mineral, fiber, and macronutrient intakes were significantly lower in underreporters.[44] Another study of the general population in Ontario, Canada, found that women who underreported reported less carbohydrate intake than others.[45] In two studies in European populations, low energy reporters had lower fat intake as a percentage of macronutrient intake.[26,46] In the current study, the finding that estimates of protein (grams/kilogram/day), cholesterol, dietary fiber, and vitamin E intake in particular were different between plausible and implausible reporters may suggest a pattern of misreporting specific foods or food components that warrants further investigation. In the aforementioned study in a nationally representative sample of the US population, Briefel and colleagues[44] found similar results with regard to lower intake of fiber and macronutrients in implausible reporters. Briefel and colleagues[44] suggest that any differences between plausible and implausible reporters appear to be energy-driven. However, it may also be possible that health-conscious participants were less likely to under-report healthy foods that are high in nutrients such as vitamins and minerals, as Bingham and colleagues[47] suggest. Additional research is warranted to examine the differential effect of underreporting on specific components of the diet.

In the current study, plausibility of rEI was determined using the rEI:TEE cutoff of <0.76 or >1.24. This is a wide range, and these cutoff values may vary depending on the criteria set by the authors.[28] Because study results reflect the choice of method and cut points, interpretation of results across studies is problematic. Given this challenge, we note that a future goal is to set standards allowing for consistency in treatment of plausibility using 24-hour dietary assessment methodology.

Notably, although there was some misreporting among study participants and accounting for plausibility did influence nutrient intake estimates, more than one half of the sample was determined to have plausible rEI using the rEI:TEE cutoff of <0.76 or >1.24. This is an interesting finding, because 67 of 82 participants were classified as overweight or obese, and higher BMI has been found to be associated with misreporting in many studies of predominantly non-Hispanic white participants, with more underreporting in heavier populations.[2]

Also of note, five of 82 participants were classified as overreporters. The higher rate of overreporting in this group compared with non-Hispanic white populations[18,48] is of interest, potentially reflecting different cultural perspectives regarding food, value of food abundance, and ideal body size. Previous studies have revealed more body satisfaction among Hispanic than non-Hispanic white women, despite higher weights.[49] In other studies ethnicity has been found not to influence preference for female shapes.[50] Socioeconomic status is a potential confounder; if socioeconomic differences are not controlled, it cannot be concluded that differences in body-size preferences are due to ethnicity per se.[50] Similar results regarding overreporting were found in Native Americans on the Pacific northwest coast of Washington State, with 7% of women classified as overreporters.[21]

Although there have been two studies done using 24-hour dietary recalls focused on the topic of misreporting in Hispanic groups, ours was the first study to examine how accounting for plausibility of rEI affects nutrient intake estimates in Hispanics, specifically Mexican Americans. In future studies examining dietary intake in Hispanics, it is important to assess dietary intake with measures that minimize misreporting. Misreporting should be monitored during the study to yield valid dietary data. Implausible reports may be removed from the analysis to include only valid reports, as in previous studies.[40,51] Misreporting may bias studies examining the relationship between dietary intake and disease, as has been demonstrated previously.[51]

Use of dietary data without assessment of validity has several other important negative consequences. Misreported dietary data may be used to identify behaviors to target in developing health messages,[29] and as baseline data from which to assess the effectiveness of interventions. Studies that do not include an assessment of the validity of dietary data and identify implausible reports may provide inaccurate information to be used to make policy decisions. Results of dietary surveys are used in the development of nutrition programs and the setting of targets for intake. Strategies for addressing nutrition issues such as overweight and obesity must be determined using accurate reports of intake of energy and other dietary components. If validity of dietary data is not assessed, food and nutrition practitioners risk providing erroneous recommendations.

The current study has several limitations. First, the lack of an individualized measure of physical activity to estimate predicted energy requirements is an important limitation. Whereas “low active” reflects the PAL of most adults in the United States,[52] energy expenditure may have been underestimated in very active individuals, potentially misclassifying implausible reporters as plausible. The use of a questionnaire and low value for PAL mirrors other studies that did not use objective measures. Black[53] suggests that an activity questionnaire be included along with dietary surveys to determine the suitable group PAL. Several studies selected a conservative “low active” level,[3,21,54] becasue choosing a high value may exaggerate the extent of underreporting. Past studies using calorimetry and doubly-labeled water confirmed the light activity value as a minimum energy requirement for normally active but sedentary populations.[55] The small convenience sample of Mexican-American women in northern California limits the generalizability of findings and may also have influenced the ability to detect a difference between plausible and implausible reporters.[17]

CONCLUSIONS

As indicated in this and two previous studies, misreporting may be a concern in Hispanics that warrants further research to explore rates, correlates, and effects of misreporting in studies measuring dietary intake in this population. Studies in other Hispanic subgroups are also warranted, because the current study focuses only on one segment of the Hispanic population. Our study in Mexican Americans reveals that plausible reporters had significantly higher intake estimates for several nutrients than implausible reporters, and were also more likely to meet recommendations for a number of micronutrients. When analyzing self-reported dietary data to determine whether a population is meeting recommendations, accounting for plausibility of rEI is an important method to consider for increasing validity of the dietary data.

To improve the completeness and quality of dietary intake information obtained from Hispanics, it is important to investigate methods to improve the accuracy of both qualitative and quantitative dietary data in this population. Studies elucidating the predictors of misreporting of energy intake may inform actions that may be taken to prevent or account for this issue. Tools that use technology such as mobile telephones to collect dietary information in real time and have a low subject burden may hold promise in this regard; the mobile telephone food record is one such instrument that has been recently developed and tested. Because self-reported dietary data is of importance for researchers, counselors, and those designing interventions, and may also be used to make policy decisions that will influence health, it may be important to address the issue of misreporting in underserved populations to avoid drawing erroneous conclusions based on inaccurate information.

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Table 1

Characteristics of a convenience sample of low-income Mexican-American adult women (aged 21-54 y) in California with complete socioeconomic, diet, and anthropometric information by plausibility of reported energy intake status[a]

Variable	Plausible reporters of energy intake (n = 46)	Implausible reporters of energy intake (n = 36)
	mean± standard deviation	
Age (y)	36.0±8.2	35.7±7.4
Anthropometric data		
Height (cm)	156.4±5.2	157.4±5.6
Weight (kg)	75.9±16.3	77.8±20.2
Body mass index	31.1±6.7	31.2±6.7
Waist (cm)	93.7±16.9	93.5±17.2
Monthly housing cost ($)	521±351	590±370
Years in United States	13.3±8.5	10.0±6.8
Acculturation score (Hispanic domain)[b]	15.5±2.8	14.7±3.7
Acculturation score (non-Hispanic domain)[bc]	4.73±4.1	4.24±4.5
Household size	4.4±1.1	4.6±1.4
	n (%)	
Place of birth		
United States	2 (2)	0 (0)
Mexico	44 (54)	36 (44)
Education level		
Elementary school or less	16 (20)	17 (21)
Middle school	1 (1)	1 (1)
High school	20 (24)	13 (16)
Trade school	5 (6)	4 (5)
University or higher	4 (5)	1 (1)
Married	39 (48)	30 (37)
Weight status[d]		
Overweight/obese	36 (44)	31 (39)
Obese	26 (32)	20 (25)

[a]Percentages may not add to 100 due to rounding.

[b]Range=0-18 (18=highest adherence to cultural domain).

[c]n=78 due to missing data.

[d]Overweight/obese defined as body mass index ≥25; obese defined as body mass index ≥30.

Table 2

Mean daily intakes of macronutrients and micronutrients estimated by dietary recalls in a convenience sample of low-income Mexican-American adult women (aged 21-54 y) in California compared with Mexican-American adult women (aged 21-54 y) sampled in the National Health and Nutrition Examination Survey (NHANES) 2007-2008

Variable	Total	Plausible	Implausible	NHANES
n	82	46	36	276
		mean± standard error of the mean		
Energy (kcal/d)	1,860±63	2,053±55	1,613±113*	1,783±36
Macronutrients				
Protein (g/kg body weight)	1.0±0.04	1.1±0.04	0.9±0.06**	1.0±0.03[a]
Protein (% energy)	16.6±0.4	15.8±0.5	17.5±0.6**	16.4±0.2
Protein (g/1,000 kcal)	41.4±0.9	39.6±1.2	43.7±1.5**	40.9±0.6
Carbohydrate (% energy)	54.0±0.8	53.6±1.1	54.5±1.3	51.3±0.5
Carbohydrate (g/1,000 kcal)	135.0±2.0	134.1 ±2.7	136.2±3.1	128.2±1.2
Total fat (% energy)	31.5±0.6	32.4±0.9	30.2±0.8	32.1±0.4
Total fat (g/1,000 kcal)	34.9±0.7	36.0±1.0	33.6±0.9	35.7±0.5
Saturated fat (% energy)	10.4±0.3	10.8±0.4	9.9±0.3	10.2±0.2
Cholesterol (mg/d)	270.6±14.4	298.4±19.2	235.1±20.7**	270.4±10.3
Dietary fiber (g/d)	22.4±0.9	24.2±1.1	20.1±1.5**	16.6±0.5
Micronutrients, vitamins				
Vitamin A (retinol activity equivalents/d)	759.1±204.5	979.4±361.7	477.6±37.9	523.6±23.5
Vitamin E (mg α-tocopherol/d)	4.0±0.2	4.4±0.3	3.4±0.3**	5.9±0.2
Vitamin C (mg/d)	110.9±6.9	119.0±9.5	100.5±9.9	83.9±4.1
Vitamin K (μg/d)	31.7±3.5	35.7±4.4	26.5±5.5	74.0±4.8
Thiamin (mg/d)	1.2±0.1	1.2±0.1	1.1±0.1	1.4±0.04
Riboflavin (mg/d)	1.6±0.1	1.6±0.1	1.5±0.1	1.9±0.05
Niacin[b] (mg/d)	16.0±0.7	16.6±0.8	15.1±0.1	21.0±0.5
Vitamin B-6 (mg/d)	1.6±0.1	1.6±0.1	1.5±0.1	1.8±0.05
Folate (dietary folate equivalents/d)	299.4±20.2	292.6±25.6	308.1±32.9	466.1±16.2
Vitamin B-12 (μg/d)	5.8±0.8	6.6±1.3	4.8±0.5	4.6±0.2
Micronutrients, minerals				
Calcium (mg/d)	784.5±44.9	837.7±69.6	716.5±49.6	856.6±26.5
Phosphorous (mg/d)	920.8±34.0	967.5±38.4	716.5±49.6	1,180.5±26.2
Magnesium (mg/d)	193.8±9.4	204.1±14.3	180.6±11.2	262.9±5.8
Iron (mg/d)	12.8±0.5	13.2±0.6	12.2±0.9	13.6±0.4
Potassium (mg/d)	2,120.4±71.2	2,217.2±89.5	1,996.8±112.9	2,356.0±53.2
Zinc (mg/d)	8.8±0.4	9.0±0.5	8.6±0.6	10.2±0.3
Copper (mg/d)	1.0±0.1	1.1 ±0.2	0.7±0.1	1.2±0.04
Selenium (μg/d)	63.0±2.9	67.4±3.3	57.5±5.0	95.5±2.2

Variable	Total	Plausible	Implausible	NHANES
Sodium (mg/d)	2,653.9±159.6	2,770.5±166.2	2,504.9±296.3	2,760.2±66.99

[a] n=275 due to 1 missing data for 1 participant.

[b] Preformed niacin only.

* Different from plausible reported energy intake at *P*<0.001.

** Different from plausible reported energy intake at *P*<0.05.

Table 3

Percent of a convenience sample of low-income Mexican-American adult women (aged 21-54 y) in California meeting Dietary Reference Intakes (DRI) by plausibility of reported energy intake (rEI) status

Nutrient	DRI	Total sample (N = 82)	Plausible rEI (n = 46)	Implausible rEI (n = 36)
	AMDR[a]		*% within AMDR*	
Protein (% kcal)	10-35	99	98	100
Carbohydrate (% kcal)	45-65	85	83	89
Total fat (% kcal)	20-35	77	72	83
Saturated fat (% kcal)	<10	48	48	47
	EAR[b]		*% less than EAR*	
Protein (g/kg)	0.66	12	9	17
Carbohydate (g)	100	0	0	0
Vitamin A (retinol activity equivalents)	500	56	57	56
Vitamin E (mg α-tocopherol)	12	99	98	100
Vitamin C (mg)[c]	60	22	17	28
Vitamin B-6 (mg)	1.1-1.3	24	17	33
Vitamin B-12 (μg)[d]	2.0	15	13	17
Thiamin (mg)	0.9	33	26	42
Riboflavin (mg)	0.9	16	11	22
Niacin (mg)	11	22	13	33*
Folate (dietary folate equivalents)	320	67	67	67
Phosphorous (mg)	580	13	9	19
Magnesium (mg)	255-265	83	83	83
Iron (mg)	5.0-8.1	9	2	17*
Zinc (mg)	6.8	32	26	39
Copper (mg)	0.700	51	41	64*
Selenium (μg)	45	27	17	39*
	AI[e]		*% greater than AI*	
Dietary fiber (g)	21-26	33	44	19*
Vitamin K (μg)	90	4	4	3
Calcium (mg)	1,000-1,200	18	22	14
Potassium (mg)	4,700	100	100	100
Sodium (mg)	1,300-1,500	83	94	69**

[a]AMDR=acceptable macronutrient distribution range.

[b]EAR=estimated average requirement.

[c]Smoking status was not considered; smoking may change vitamin C requirements.

[d]Comparison to EAR for ages 50 y and older are difficult because 10% to 30% of older people may malabsorb food-bound vitamin B-12.

[e] AI=adequate intake.

[*] $P<0.05$ between plausible and implausible reported energy intake.

[**] $P<0.01$ between plausible and implausible reported energy intake.